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Exploring the Critical Success Factors in Agile Project Management: A Comprehensive Survey Analysis

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Abstract

This study aims to identify the key factors that contribute to successful outcomes in agile projects. A survey was conducted with 121 experts in the field, and confirmatory factor analysis was used to establish a construct related to project success. Multiple linear regression analysis was then employed to determine the significant CSF that influences success. The results indicate that 59.7% of success in agile projects can be explained by the identified factors. These factors include aligning work processes with agile methodologies, providing training and education on agile practices, prioritizing interpersonal skills and communication over processes and tools, co-locating project teams, engaging customers in the development process, and ensuring staff expertise.

Keywords
Agile project management, critical success factors, multiple linear regression

1. Introduction
Add Towards the end of the 1990s, software development teams began adopting new work methodologies aimed at enhancing programming processes and making them more continuous and incremental. These methodologies were centered on concepts such as autonomy, adaptability, modularity, and collaboration (Hidalgo, 2019).

In the early 2000s, a group of seventeen software developers published the "Agile Manifesto" in which they sought to establish fundamental principles and values for enhancing software development projects. These principles formed the foundation of what is known as "Agile Project Management", a methodology that has since gained widespread

acceptance and surpassed the boundaries of the Information Technology sector to become popular in several other sectors as well.

Shastri et al. (2021) suggest that agile project management represents a significant departure from the prevailing thinking of the past, which relied heavily on early specification determination, extensive planning efforts, and the creation of detailed documentation of work processes, commonly known as Waterfall.

According to Lindsjørn et al. (2016), agile project management is characterized by a collaborative work environment, a multidisciplinary approach, collective decision-making, and the utilization of small work teams. This is in contrast to traditional project management methods that prioritize a hierarchical structure and individual specialization.

While agile project management has many benefits, various factors can impact project outcomes. As a result, there is a lively discussion in the scientific literature around "Critical Success Factors" (CSF), a term first coined by Rockart (1979) to describe the crucial elements that contribute to successful project performance. When examining the scientific literature on project management, it becomes clear that there is a wide-ranging discussion on Critical Success Factors (CSF), a term originally coined by Rockart (1979) to describe the essential elements required for successful project performance. There is a general consensus among researchers that the presence or absence of these factors plays a significant role in determining project success (Inayat, 2014).

Despite the widespread recognition of the importance of Critical Success Factors (CSFs) in project management, Pacagnella Junior et al. (2019) point out that there has been a limited number of empirical studies aimed at identifying the relationship between these factors and project success. While the scientific literature has extensively discussed the significance of CSFs, there remains a gap in the research when it comes to providing evidence-based insights into the practical implications of these factors. Therefore, further investigation into the relationship between CSFs and project success is needed, particularly in the context of agile project management, to enhance the understanding of how these factors impact project outcomes.

The lack of empirical evidence on the relationship between CSFs and project success in the context of agile project management is particularly problematic, given the increasing popularity of this approach. It is essential to determine the factors that contribute to project success in agile environments to ensure that teams can maximize the benefits of this approach while minimizing risks and challenges. Thus, empirical research that investigates the relationship between CSFs and project success in agile environments is necessary to provide practical insights for project managers, practitioners, and scholars alike.

In this sense, the increasing number of publications on agile project management in recent years indicates a growing interest in the subjects (CSFs and Agile project management) among academics. Additionally, many professionals in the field believe that using agile methodologies can improve project productivity and efficiency. Therefore, there is a shared interest in studying and implementing agile project management practices to achieve better project outcomes (Lechler and Yang, 2017).

Generally, studies on these subjects face challenges in classifying Critical Success Factors (CSFs) related to agile projects due to their high volatility and specific characteristics, which indicate that the factors identified in one study may differ from those found in another. This has sparked the interest of researchers in the field, as highlighted by Ahimbisbwe et al. (2015).

Taking into account the arguments provided, the objectives of the work will be outlined in section 1.1. The structure of this study includes a literature review on Critical Success Factors after the Introduction section. Subsequently, the research methods are presented, followed by the presentation and discussion of the results. Finally, the conclusions are presented with the limitations and suggestions for possible future works.

1.1 Objectives

Based on the arguments presented, this study aims to contribute to the existing body of knowledge by analyzing the empirical relationship between Critical Success Factors (CSFs) and project success in the context of agile methodologies. To achieve this objective, a comprehensive list of CSFs identified from recent scientific literature will be used as the basis for the analysis. Specifically, the study seeks to understand the extent to which the presence or

absence of CSF influences the success of projects that adopt agile methodologies. By addressing this research gap, the study aims to provide practical insights for project managers and contribute to the development of effective project management strategies.

From this objective, we seek to contribute in two different ways. The first is related to the academic contribution and seeks to offer complementarity to previous studies that were dedicated to these themes, such as Chow and Cao (2008), Misra et al. (2009), Dikert et al. (2016), Tam (2020) and others. The second is aimed at organizations, where the results found may support the decisions of managers who use agile methodologies in their projects, seeking to increase their level of success.

2. Literature Review

In order to facilitate empirical research, it is essential to analyze the existing scientific literature on Critical Success Factors (CSFs) related to projects that use agile methodologies. This section therefore presents the findings of a comprehensive search conducted in recent journals, which includes works that have empirically analyzed CSFs.
To enhance the organization of the text, the identified factors have been classified into six categories, which will be presented in a sequential manner. The first category is Organizational Factors, which is displayed in Table 1 below.

Table 1. Organizational factors

CSF	References
OR1. Cooperative culture	Faisal Abrar et al. (2019)
OR2. Top management support	Lill and Wald (2021)
OR3. Work environment suitable for agile methods	Rola et al. (2016)
OR4. Colocation of project team	Gregory et al. (2022)
OR5. “Face-to-face” communication	Malik et al. (2021)

The initial CSF highlighted in Table 1 pertains to the presence of an organizational culture that emphasizes collaborative work. In particular, a cooperative culture is deemed more advantageous than a traditional or hierarchical culture in organizations, particularly for projects that utilize agile methodologies. This is because a cooperative culture typically minimizes organizational complexity and prioritizes human aspects, thereby facilitating greater cooperation and collaboration among team members (Faisal Abrar et al., 2020).

The second CSF outlined in Table 1 pertains to the backing provided by top management, which entails establishing an environment that fosters work agility by endorsing the decisions made by the team. This support not only enhances team safety and autonomy, but also bolsters motivation among team members (Lill and Ward, 2021).
Another element featured in Table 1, as emphasized by Rola et al. (2016), pertains to the establishment of a conducive environment for executing projects that utilize agile methodologies. This environment should promote verbal communication, facilitate the exchange of information, and foster a shared understanding of the team's work among its members.

Co-location, which refers to the physical proximity of team members, is another factor identified in the scientific literature. According to Gregory et al. (2022), this condition facilitates prompt and informal communication, promotes collaboration in the workplace, and eases the integration of new team members. Lastly, the final CSF highlighted in Table 1 pertains to effective communication, which is widely regarded as a critical determinant of project success. Effective communication not only fosters a dynamic work environment, but also enhances interactivity among team members and clients. It promotes greater involvement and ultimately contributes to the production of a higher quality final product (Malik et al., 2021). The next category of CSFs is People Factors, shown in Table 2 below.

Table 2. People factors

CSF	References
PE1. Self managed teams	Smite et al. (2021)
PE2. Interpersonal communication skills	Gren, Knauss e Stettina (2018)
PE3. Team flexibility	Werder e Maedche (2018)
PE4. Team motivation	Zavyalova, Sokolov e Lisovskaya (2019)
PE5. Team expertise	Gregory et al. (2022)

The first of the FCS presented in Table 2 is the formation of self-managing teams. According to Smite et al. (2021), teams possessing this characteristic tend to be better equipped to solve problems and engage in reflective thinking, as well as exhibit a greater commitment to work-related issues.

Another FCS related to projects utilizing agile methodologies, as highlighted by Gren et al. (2018), is the possession of interpersonal communication skills. This factor is critical as it significantly impacts daily activities. The authors emphasize the importance of team members' ability to communicate clearly, whether in discussions about problems, negotiations with users, or other such situations.

Another CSF in this category is project team flexibility. Werder and Maedche (2018) argue that this is a crucial characteristic of agility in any organization, as it relates to the team's ability to adapt to various situations and learn from changes, which can significantly impact its responsiveness and efficiency. Table 2 also presents people's motivation as a relevant CSF. According to Zavyalova et al. (2020), in projects that utilize agile methodologies, this factor is primarily associated with non-material incentives such as a sense of community, autonomy, internal trust, the variety and significance of work, and its transparency. Lastly, the final CSF in this category pertains to the team's expertise, which involves the level of technical knowledge, skills, and experience of individuals in this type of environment. Gregory et al. (2022) suggest that this factor has a direct impact on the efficiency and quality of the work performed. The next category of CSFs is technical factors, which are presented in Table 3 along with their corresponding references.

Table 3. Technical factors

CSF	References
TC1. Pursuing simple design	Stankovic et al. (2013)
TC2. Training and educations in agile methods	Hameed et al. (2016)
TC3. Delivery strategy	Aldahmash et al. (2017)
TC4. Proper project documentation	Mnkandla (2017)
TC5. Integration tests	Tsoy and Staples (2021)

The first CSF presented in Table 3 is the pursuit of a simple design, as cited by Stankovic et al. (2013). The authors suggest that seeking the simplest possible design for a product is related to waste reduction and increased collaboration, leading to positive impacts on project quality and efficiency. The presence of agile methodology training is another critical success factor listed in Table 3, as it enhances the technical proficiency of team members through the acquisition of knowledge and skills subsequent mastery of techniques and tools related to agile project management (Hameed et al., 2016).

Aldahmash et al. (2017) highlighted another critical success factor presented in Table 3, which is the use of a strategy of frequent and incremental deliveries of product features that can be presented and tested by users. This type of strategy helps in early identification and correction of problems and avoids wasting time and teamwork. Maintaining an adequate level of project documentation is another important factor presented in Table 3, as mentioned by several authors including Chiyangwa and Mnkandla (2017). This factor is related to the formalization of work activities without excess bureaucracy, suitable for the use of agile methodologies. In this way, much of the effort expended to document the project is transferred to work activities that add value.

The final critical success factor presented in Table 3 is the execution of integration tests, as highlighted by Tsoy and Staples (2021). In agile projects, incremental deliveries are typically presented and verified by users, but it's crucial to ensure that all delivered parts are integrated and function correctly. This requires carrying out integration tests to identify and address any issues that may arise. The fourth category of CSFs is called Process Factors, and it includes five representatives which are shown in Table 4.

Table 4. Process factors

CSF	References
PC1. Following agile-oriented management process	Ramasubbu et al. (2015)
PC2. Client involvement	Jørgensen (2016)
PC3. Daily meetings focused communication	Azanha et al. (2016)
PC4. Process oriented for requirements	Hannay et al. (2017)
PC5. Adaptative change management process	Kamal et al. (2019)

The first CSF presented in Table 4 is the orientation of processes towards agile methodologies, which, according to Ramasubbu et al. (2015), involves completing work through short interactions, involving customers in decisions, and delivering quick feedback. This approach leads to increased knowledge generation and maturity in project management.

Another factor identified in the literature in this category is the level of customer involvement. In projects that use agile methodologies, customers play a central role, particularly in two aspects: providing requirements and giving feedback on deliveries. Jørgensen (2016) highlights that this aspect is directly associated with achieving success and must, therefore, be properly managed in projects of this nature.

Azanha (2016) also suggests that communication focused on daily meetings is a CSF linked to processes. These are quick, daily meetings that can be held with the team standing and serve the purpose of keeping team members updated on the project's progress and ensuring that promises are kept.

Table 4 also presents the orientation of processes towards the requirements coming from different project stakeholders as another CSF. According to Hannay et al. (2017), requirements should be refined throughout the project lifecycle as knowledge about the project increases. This approach leads to an evolution of processes and increased stakeholder satisfaction.

In the category associated with processes, the last CSF listed in Table 4 is adaptive change management. Kamal et al. (2019) argue that in projects that use agile methodologies, work processes need to be adaptive and flexible to effectively implement any changes. This study also identifies another important category of success factors, Project Factors, which is presented in Table 5

Table 5. Project factors

CSF	References
PC1. Clear objectives and goals	Cooper (2019)
PC2. Interactive work	Venkatesh et al. (2017)
PC3. Work with small teams	Ahimbisibwe (2017)
PC4. Accelerated delivery	Milićević (2019)
PC5. Work progress measurement by deliveries	Alyahya et al. (2013)

The first CSF listed in Table 5, as cited by Cooper (2019), emphasizes the importance of establishing clear objectives and goals for the project. Although agile methodologies often provide only a high-level definition of scope at the beginning, defining clear objectives and goals can act as a guide for the team members and ensure that everyone shares the same vision about what the project should achieve.

Another important CSF for agile project management is the iterative nature of the work, where self-organized teams frequently receive and evaluate feedback on their progress. This allows them to gradually approach the desired

specifications of the final product and meet the customer's needs (Venkatesh et al., 2017). Ahimbisibwe (2017) also highlights the importance of using small project teams with experience and skills in agile and self-organized management. This approach leads to higher levels of integration, adaptability, and engagement, making the team more efficient and responsive.
The fourth CSF listed in Table 5, as cited by Milicevic et al. (2019), emphasizes the importance of maintaining an accelerated pace of deliveries throughout the project. Working in short steps with incremental development and quick feedback from customers increases work adaptability and efficiency. The last CSF associated with this category involves measuring work progress through the deliverables of each interactive cycle. In agile projects, the focus is on execution, and measuring progress through deliverables values the results themselves rather than just the effort employed. This approach differs from traditional methodologies that focus on comparing the percentage of work done to planned work (Alyahya et al., 2013). The last category of CSF to be explored in this work is classified as Cultural Factors and is presented in table 6.

Table 6. Cultural factors

CSF	References
AV1. Individuals and interactions over processes and tools	Larson e Chang (2016)
AV2. Working software over comprehensive documentation	Wagenar et al. (2018)
AV3. Customer collaboration over contract negotiation	Serrador e Pinto (2015)
AV4. Responding to change over following a plan	Larson e Chang (2016)

Cultural factors form the core values of agile management, starting with prioritizing individuals and their interactions over tools and processes. In this sense, experienced individuals who work together in an integrated way are more effective than an inexperienced team that relies on a set of methods and tools (Larson and Chang, 2016).

The second factor is related to the pragmatism of agile methodologies, whose origin is in software development. According to Wagenar et al. (2018), "working software over comprehensive documentation" is a fundamental principle. Although documentation is an essential form of communication in projects, informal, face-to-face communication is more effective due to the tacit transfer of knowledge that it promotes, which often does not need to be formalized, saving time and effort.

Another cultural factor is prioritizing collaboration with customers over negotiating contracts. Agile methods rely on frequently involving customers in iterative work cycles, providing feedback, and helping to guide the project team. Collaborating with customers speeds up this process, unlike contract negotiations, which would only increase bureaucracy (Serrador and Pinto, 2015).

The last CSF in Table 6 involves valuing responding to change over following plans. According to Larson and Chang (2016), requirements changes lead to scope changes, which impact resources, budget, and schedule, which is problematic in traditional project management approaches. In agile environments, bureaucracy must be minimized so that the focus is on carrying out the work and adding value, and there must be responsiveness so that any changes are carried out efficiently.

3. Methods

The first methodological aspect to consider is the classification of this study. Based on the stated objectives in the introduction, this research can be classified as exploratory, aiming to understand the impact of critical success factors (CSFs) on achieving success in projects that use agile methodologies. To accomplish this goal, a survey was conducted with project managers who have experience working with agile methodologies. Participants were asked to provide responses related to a project they had managed that used agile methodologies. The survey was developed using a seven-point Likert-type scale, which included CSFs identified in the previous section, as well as eight project success dimensions. These dimensions were identified through an extensive literature review Figure 1.

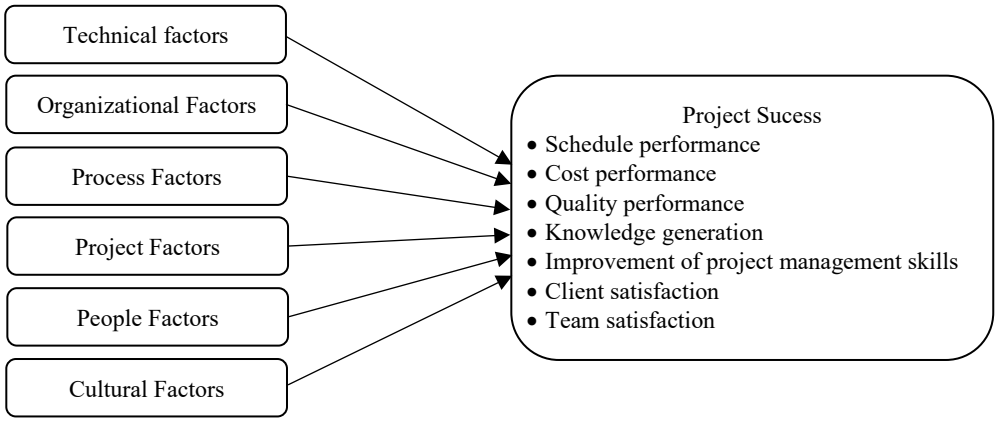

Figure 1. Conceptual model

Figure 1 presents the conceptual model depicting the relationship between CSFs and the achievement of success in projects that use agile methodologies. The sampling process was non-random and based on judgment, utilizing resumes obtained from the LinkedIn platform (www.linkedin.com). Before the data collection process began, a pilot test was conducted with 15 experts in the field, and adjustments were made based on their feedback. Additionally, Cronbach's Alpha was calculated using the first 30 results to evaluate internal consistency, and the result was 0.830, indicating no issues in this regard.

Out of 348 questionnaires that were sent, 121 valid responses were obtained after excluding questionnaires that were missing or outliers. The first step was to perform a Confirmatory Factor Analysis using ADANCO 2.4 software, since success in projects is multidimensional according to Shenrar (2001). The eight variables representing success in the questionnaire were confirmed to constitute a single factor, and its score represented the variable "success" in the investigated projects. Subsequently, the multiple linear regression technique was used with the software SPSS vs. 25, with the "Stepwise" method to test the set of CSFs for building the regression model with the highest explanatory power for project success. To ensure the appropriate use of this technique, the following basic assumptions were verified according to Zeith (2019). Scatterplot of dependent variable and residuals are shown in Figure 2.

• Linearity between the dependent and independent variables: Verified through Scatterplots (not presented due to size)
• Independence of error terms – Verified with the Durbin-Watson test (Table 7).

Table 7. Durbin-Watson test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,773[a]	,597	,491	,713	1,631

• Homoscedasticity – Verified with a Scatterplot of the dependent variable and residuals

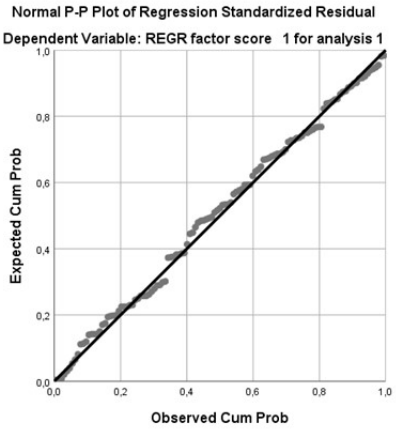

Figure 2. Scatterplot of dependent variable and residuals

• Normality of error terms – Verified with the Kolmogorov-Smirnov test (Table 8)

Table 8. Kolmogorov-Smirnov and Shapiro-Wilk tests

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual	,049	121	,200*	,988	121	,339

After verifying the basic assumptions for the use of multiple linear regression, we conducted the analysis and will present the results in a dedicated section later in this work.

5. Results

5.1 Sample Description

This section aims to describe the characteristics of the sample collected in this research. We will present details regarding the respondents, the projects they were involved in, as well as the organizations where these projects took place.

Table 9. Sample composition (Country and size of companies)

Country	Brazil	71.90%
	United States	10.74%
	Canada	4.13%
	France	4.13%
	India	3.31%
	Denmark	1.65%
	United Kingdon	1.65%
	Germany	0.83%
	Australia	0.83%
	Uruguay	0.83%
Size (Number of employees)	1 a 9	11.6%
	10 a 99	9.1%
	100 a 900	28.1%
	1000 or more	51.2%

Based on the information presented in Table 9, it can be inferred that the majority of organizations in the sample are from Brazil (71.9%), with a smaller representation from the United States, Canada, France, and India. In terms of size,

more than half of the sample consists of companies with 1000 employees or more, followed by companies with between 100 and 999 employees. The smallest companies, with 1 to 9 employees, and those with 10 to 99 employees, make up a smaller proportion of the sample. These results suggest that the study may have a greater focus on larger companies and Brazilian organizations.

Table 10. Sample composition (experience and hierarchical level of respondants)

Experience with Agile Project Management (years)	1 to 5	30.60%
	6 to 10	36.40%
	11 to 15	15.70%
	16 or more	17.20%
Hierarchical Level	Operational	27.30%
	Tactical	28.90%
	Strategic	43.80%

Table 10 provides information on the characteristics of the respondents. The data shows that the highest proportion of respondents have 6 to 10 years of experience with projects that use agile methodologies (36.4%), followed by those with 1 to 5 years of experience (30.6%). Additionally, 17.2% of the respondents have 16 or more years of experience, while 15.7% have between 11 and 15 years of experience.

Regarding the level at which the respondents work, the majority are strategic-level professionals (43.80%), followed by those working at a tactical level (28.9%) and those at an operational level (27.30%). These findings indicate that the respondents generally have considerable experience with agile methodologies and are working at a higher level within their organizations, with a greater emphasis on strategic planning and decision-making.

Table 11. Sample composition (Project characteristics)

Size of project team	1 to 5	30.60%
	6 to 10	36.40%
	11 to 15	15.70%
	16 or more	17.20%
Project duration	3 months or less	15.70%
	4 to 12 months	33.10%
	More than 12 months	51.2%
Agile methodology	Scrum	41.30%
	Mixed (Scrum + XP/Lean/Kanban)	54.60%
	Lean	4.10%

Table 11 provides information about the characteristics of the projects. The data shows that the majority of project teams consist of between 1 to 5 and 6 to 10 people, with each stratum representing 30.6% of the sample. Teams with 16 or more people were less common (17.2%), followed by teams with 11 to 15 people (15.7%). In terms of project duration, more than half of the projects in the sample lasted longer than 12 months (51.2%), with the remainder lasting from 4 to 12 months (33.1%). With regard to the use of agile methodologies, only three were cited. The most common approach was a combination of Scrum with XP, Lean, or Kanban (54.6%), followed by the pure use of Scrum (41.3%) and the use of Lean (4.1%). These results indicate that the sample's projects generally involve teams of up to 10 people, have a longer duration, and tend to use a mixed approach involving Scrum and other methodologies such as XP, Lean, or Kanban.

5.2 Regression results

In this section, the results of multiple linear regression analysis are presented. The first aspect to note is the explanatory power of the model, which achieved an R^2 value of 0.597. This indicates that the model can account for 59.7% of the

success of the projects in the sample. This value is considered good for a regression model, particularly in exploratory research. Table 12 presents the coefficients and significant values for the regression model variables.

Table 12. Results of the multiple linear regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-4,661	0,504		-9,247	0,000
TC2	0,186	0,046	0,300	4,074	0,000
OR4	0,114	0,028	0,263	4,111	0,000
PE2	0,178	0,088	0,146	2,016	0,046
PE5	-0,151	0,062	-0,191	-2,420	0,017
PC2	0,090	0,040	0,141	2,218	0,029
PR1	0,255	0,051	0,367	5,028	0,000
VA1	0,212	0,050	0,275	4,256	0,000

Table 12 shows that out of the 29 critical success factors (CSFs) analyzed, only seven are part of the model that has the greatest explanatory power for success in projects that use agile methodologies. Four of these CSFs are significant at a level of 1%, while the remaining three are significant at a level of 5%. Among the CSFs with a p-value of less than 0.01, which indicates statistical significance at a level of 1%, the most influential factor in achieving success compared to the others (as it has the highest standardized coefficient) is the adoption of agile work processes (PR1). According to Fredriksson and Ljung (2011), this means that the project team has the freedom to work and adapt without being bound by the original plan or schedule specified for the project. This increased flexibility tends to make the project more responsive to customer needs throughout its life cycle.

According to Table 12, the second most influential critical success factor (CSF) for achieving success in projects that use agile methodologies is training and education in agile practices (TC2). Kilu et al. (2019) suggest that organizations offering training to their teams are more likely to successfully implement agile practices, as this enables the development of know-how that supports agile project management.

The third most influential CSF, in descending order of importance, is prioritizing individuals and their interactions over processes and tools (AV1). This CSF represents one of the four "Agile Values" that are crucial as part of an organization's culture for the successful adoption of Agile methodologies. It emphasizes the significance of direct collaboration between people, particularly in activities that involve face-to-face interactions. Although processes and tools are important, the focus should be on having motivated individuals who work well together (ASFAW et al., 2022).

The last critical success factor (CSF) among those statistically significant at 1%, in descending order of influence on achieving success, is project team co-location. This CSF refers to situations where team members are physically located in the same space or facility, which is considered a crucial element for quick and direct communication. It also promotes a sense of community that helps the team feel comfortable and confident in openly participating in the project (Chang, 2010).

Among the significant factors at a level of 5%, the one with the greatest influence on achieving success is interpersonal skills (NP2). According to Zainal et al. (2020), these skills are diverse, including negotiation, coaching, conflict

management, sharing experiences, leadership, and protecting peers. This set of skills enhances team cohesion and helps create a more responsive and adaptive environment, which is essential in projects that use agile methodologies. The second significant critical success factor (CSF) at a level of 5% is customer engagement (PC2). Hoda et al. (2011) emphasize that this factor is crucial for the effective use of agile methodologies, as they aim to be adaptable and responsive, particularly in terms of the requirements proposed by customers throughout the project life cycle. Thus, the greater the customer engagement, the more likely the project is to perform well.

The last CSF presented in Table 12 is team expertise (PE5), which is noteworthy for presenting a negative standardized coefficient, indicating that among the projects in the sample, it has a negative impact on achieving success. Although this result is contradictory, it may suggest that using highly experienced team members carries the risk of introducing biases and resistance to the team, which can impede their collaboration and, consequently, the project's outcome. Finally, it is worth highlighting that the statistically significant CSFs presented in Table 12 are from all categories presented in the second section of this work, indicating that success is explained by a heterogeneous and broad set of elements.

6. Conclusions

The objective of this study was to explore the impact of critical success factors (FCS) on achieving success in projects that use agile methodologies. The study involved conducting a survey among experienced professionals who have managed projects of this type. Participants were asked to consider a project they managed and complete a Likert-type scale questionnaire on the presence of FCS and the success achieved in the project.

Data collected from the survey was analyzed using two techniques. The first technique was Confirmatory Factor Analysis, which aimed to determine whether the eight success dimensions analyzed could be considered as a single factor. The second technique was multiple linear regression, which involved constructing a model using critical success factors identified in the literature as independent variables and success factor as the dependent variable. This analysis helped to understand the relationship between the identified FCS and project success in an agile context.
Based on the results obtained through multiple regression analysis, two conclusions were drawn. Firstly, the constructed model was deemed valid and appropriate, as all the necessary assumptions for using the technique were met, including linearity between the dependent and independent variables, independence of error terms, homoscedasticity, and normality of error terms. Furthermore, the model's ability to explain the variance in the data was close to 60%.

Secondly, the analysis revealed that out of the 29 critical success factors (FCS) investigated, only seven were able to explain success in agile projects. These seven factors, in decreasing order of importance, were orienting work processes to agile methods, providing training and education in agile methodologies, prioritizing individuals and their interactions over processes and tools, co-locating project teams, having strong interpersonal skills, engaging customers, and possessing team expertise (which surprisingly demonstrated a negative impact on achieving success). Despite the importance of the results obtained in this study, it is important to acknowledge its limitation in terms of statistical inference. Since the sampling process was not random, the results cannot be generalized beyond the sample used in this study.

To confirm or expand these findings, it is recommended to conduct additional surveys with experts in the field. Structural equation modeling can be used to analyze hypotheses about critical success factor (CSF) categories, each of which can be considered as a reflective construct. Furthermore, it is suggested to conduct case studies in organizations that use agile methodologies to deepen the study of each CSF or category. This approach would provide a more comprehensive understanding of the factors that influence success in agile projects and could help identify additional CSFs that were not captured in this study.

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